

REMARKS/ARGUMENTS

Introduction

5 The Office Action rejects claims 1-9 under 35 USC § 112, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

The specification has been amended to properly acknowledge and respect the trademark, VELCRO.RTM, and to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

10 The specification has also been amended to further clarify the meaning of the term, "fingerpad".

All current claims 1-9 have been canceled and replaced by claims 10-18, to properly acknowledge and respect the trademark, VELCRO.TM, and to conform claims 1 (now 10) and 6 (now 15) with limitations contained in the specification.

15 The Office Action rejects claims 6-9 under 35 USC § 102 as being anticipated by Turangan (5,316,294).

The Office Action rejects claims 1-5 under 35 USC § 103 as being unpatentable over Turangan (5,316,294) in view of Rudell (5,195,745).

20 Applicant respectfully requests reconsideration and withdrawal of these objections, on the basis of the remarks and arguments presented below.

The Objection to the Specification and Claims Rejection Under § 112

25 Applicant respectfully acknowledges and accepts the guidance provided by the Office Action with respect to proper usage of trademarks, and the identification and description of goods associated with a Trademark or Trade Name. The specification and claims have been amended to conform with proper usage, and to define the invention more particularly and distinctly.

30 The Office Action states that there is insufficient antecedent basis for the limitation "the fingerpads" recited in line 6 of Claim 1 and line 6 of Claim 6. Applicant respectfully submits that the term "fingerpad" has sufficient antecedent basis as a physical feature of the human hand. The term "fingerpad" is used without definition in numerous U. S. Government and academic

publications (Appendix 1), and is used in Igaki, et al. (U. S. Patent No. 5,109,428), in the abstract without definition and in the specification with definition: "the palm side of a human fingertip" (Col. 1, Lines 21-22).

5 However, Applicant has amended the specification by inserting the definition recited in Igaki, for added clarity.

Applicant respectfully submits that the specification and claims, as amended, now comply with Section 112, and requests reconsideration and withdrawal of this objection.

The Present Invention Is Not Anticipated by Turangan

10 The Office Action rejects claims 6-9 under 35 USC § 102 as being anticipated by Turangan (U. S. Pat. No. 5,316,294).

The Office Action describes Turangan as showing "a football kicking training aid", comprising in combination a football having "at least one attached patch (fastener 43), said patch or patches covering one or both pointed ends of
15 said football...a flexible glove (10) having a plurality of fingers (44), said fingers having lateral areas positioned adjacent the finger pads (hook fasteners 44) of a user wearing said glove....whereby said mating of said complementary fastener elements urges a user to properly support said football."

Applicant respectfully submits that this description is not accurate, and
20 that the reference does not teach what the Office Action claims. Turangan discloses only a special glove and football "facilitating the game of catch" (Col. 1, lines 9-10), and no mention is made of kicking the football. The design described and claimed is intended to "facilitate catching the ball with both the front and back side of the hand" (Col. 1, lines 40-41) and to "facilitate not only
25 the catching of the football 21 but also the throwing of the football." Physical features claimed are well suited to these actions, but not to kicking or to training related to kicking a football, and do not anticipate the present invention.

The invention described and claimed in Turangan features extensive, rather than restricted, coverage of the glove and football with hook and loop
30 attachment material, including coverage of the palm, fingers and thumbs of both

sides of the glove (Col. 3, lines 1-19) and coverage of strips which extend from one end of the football to the other (Col. 3, lines 20-29; Col. 4, lines 4-7).

Turangan describes the fasteners 43 (FIG. 4, FIG. 5) as "provided in a plurality of rectangular strips 54 which extend between the ends 30, 32 of the football 21." [Emphasis added.] The Office Action incorrectly describes said strips as "at least one patch" and "patch or patches covering one or both pointed ends of said football").

This misunderstanding of the reference in the Office Action, by attributing novel structural features of the present invention to Turangan, creates confusion as to distinct structural features and their novelty and unobviousness in the present invention.

The term "patch", recited in the present application, (e.g. Claim 1: "at least one patch", "patch or patches covering one or both pointed ends of said football") means a small area (Appendix 2, Compact Oxford English Dictionary), whereas the recitation in Turangan of a "plurality of rectangular strips" which extend between the two ends of the football and cover both ends (Claim 1, Lines 37-47; Claim 7, Col. 5, Lines 12-16; Col. 6, Lines 1-6), clearly describes a larger area, shown in FIG. 4 and 5 as covering more than one-half of the football and covering both ends, not "one or both pointed ends".

Figures 1 and 2 of Turangan show more than one-half of the area of the glove covered with attachment material, and Figures 4 and 5 show more than one-half of the area of the football covered with attachment material, even at the midline. The combination of glove and football, both having more than one-half of their surface areas covered with attachment materials, are even intended to enable "a user to catch the football 21 on either side of the hand." The extremely large and non-specific areas of attachment between the glove and ball, intended to facilitate catching the ball, distinguish Turangan from the current invention, which describes and claims a *combination device*, featuring a small and specific area of attachment between the thimble or glove and the football. The small areas of the patch covering the football end, and of the pad covering a specific area of the thimble or glove adjacent to a single finger, and the precise

matching *required for the training effectiveness of the attachment*, are entirely distinct and contrary to the broad and non-specific matching recited in Turangan.

Applicant specifically distinguished the present invention from Turangan and other prior art; Turangan was specifically referenced: "The restriction of the Velcro.RTM. loop elements to the patch or patches **2** of the football **1** is important. No Velcro.RTM. materials are positioned elsewhere on the football as shown in prior patents (U. S. Pat. No. 5,570,882; U. S. Pat. No. 5,183,263; U. S. Pat. No. 5,195,745)". (Present application, Page 4, Lines 1-4). ("The use of the Velcro.RTM. in a patch or patches *only* on the pointed end or ends of the football forces the thimble or gloved user to properly support the football *only* at such patch." Present application, Page 2, Lines 12-14). [Emphasis added.]

The Office Action's description of Turangan, "whereby said mating of said complementary fastener elements urges a user to properly support said football" is inaccurate.

Turangan teaches away from the present invention, which does urge the user to properly support the football for kicking, by restricting the areas of attachment of the football and thimble or glove to small specific areas. The combination of football and glove in Turangan allows and encourages extremely large and non-specific attachment between the football and glove, and is "even intended to enable "a user to catch the football **21** on either side of the hand." The combination of football and glove claimed in Turangan *could not* urge the user to properly support the football, as claimed in the present invention because of these structural differences.

Turangan describes and claims coverage of the ends of the football by a "plurality of rectangular strips" (Col. 3, Line 25; Lines 30-45) "aligned to fully cover the end of the football without overlapping" (Claim 1, Line 46-47), whereas the current invention describes and claims coverage of the pointed end of the football by a single patch of hook or loop material affixed to one end of the football, or by a single patch of such material affixed to each end of the football.

Thus, Turangan teaches away from the specific area of attachment recited in the present invention, by reciting the pattern of attachment of the loop fasteners to the outer surface of the football ("The pattern of this attachment can facilitate not only the catching of the football 21, but also the throwing of the football 21. In a preferred embodiment the loop fasteners 43 are provided in a plurality of rectangular strips which extend between the ends 30, 32 of the football 21."; Col. 3, Lines 20-26). ("With the illustrated pattern wherein the strips 54 alternate with exposed portions of the outer surface 38, the strips 54 provide raised edges which facilitate grasping the football 21. Since this raised edge 65 occurs on both sides of strips 54, the football 21 can be grasped with increased facility by either the right or the left hand."; Col 3, Lines 47-53). ("Similarly, any ball can benefit from the placement of loop fasteners in the form of strips which provide fully covered opposite ends and spaced strips along a central section."; Col 4, Lines 4-7).

Applicant submits that the specification and claims of the present application, as submitted, are patentably distinct from the claims of Turangan and all other prior art. However, in order to further clarify the present invention, claim 1, line 12 and claim 6, line 12 as submitted (now claims 10 and 15) are amended by the insertion of only ("at said patch only at said upper end"). The basis for this insertion is provided in the specification ("in a patch or patches only on the pointed end or ends of the football forces the thimble or gloved user to properly support the football only at such patch." Present application, Page 2, Lines 12-14).

Applicant further submits that the term "patch" means a small area, (Appendix 2, Compact Oxford English Dictionary), without further specification, but in order to clarify the present invention, Applicant requests amendment of claim 1, line 3 and claim 6, line 3, (now claims 10 and 15), by insertion of the limitation: "and not having a diameter greater than two inches". The basis for this insertion is provided in the specification ("in a patch or patches only on the pointed end or ends of the football forces the thimble or

gloved user to properly support the football only at such patch." Present application, Page 2, Lines 12-14).

**The Novel Physical Features of Claims Are Unobvious And Patentable
Over These References Cited Under § 102**

5 Turangan describes and claims coverage of both ends of the football by a "plurality of rectangular strips" (Col. 3, Line 25; Lines 30-45) "aligned to fully cover the end of the football without overlapping" (Claim 1, Lines 46-47), whereas the current invention describes and claims coverage of the pointed end of the football by a single patch of hook or loop material affixed to one end of
10 the football, or by a patch of such material affixed to each end of the football. Thus (1) Turangan claims coverage of both ends of the football; (2) coverage is accomplished by the attachment to the football of a plurality of strips of mating material, (3) each extending from end to end of the football, and (4) each tapered at each end so that each end is covered by a mosaic of said tapered ends fitted
15 together. (5) Turangan further claims coverage of a large portion of the football other than the pointed ends, by reciting a "plurality of rectangular strips", whereas the present invention specifically recites the coverage of the football by mating material ("only on the pointed end or ends of the football"; present application, Page 2, Lines 12-14; Claim 10, Line 2; Claim 15, Line 2).

20 Further, the present application recites and claims a *combination* of a glove or thimble and a football, each component of the combination having attached a small area of a mating material (a pad attached to the glove or thimble and a patch attached to the football).

**The Time Period Between Prior Art and the Present Invention Is Evidence
25 of Novelty and Unobviousness**

The time period of approximately nine years between the most recent of the references cited in this objection and the present application is clear evidence that the present invention is novel and unobvious.

Applicant Was First To Recognize The Problem Solved By This Invention

30 Applicant was the first to recognize the problem solved by this invention. Turangan's invention satisfactorily solved the problem recognized in that

specification; there was no impetus to modify that invention further as suggested by the Office Action, and most certainly not in the direction suggested by the Office Action. Further, Rudell's invention (5,195,745) satisfactorily solved the problem recognized in that specification; there was no impetus to modify that invention further as suggested by the Office Action, and most certainly not in the direction suggested by the Office Action. Similarly, Applicant's prior invention (U. S. Pat. No. 5,570,882) satisfactorily solved the problem recognized in that specification, and Applicant was aware of and referenced both Turangan and Rudell. However, only Applicant's later recognition of the problem solved by the current invention provided the impetus for this invention.

For all of the above reasons, Applicant submits that Turangan does not anticipate the present invention, and Applicant respectfully requests reconsideration and withdrawal of the Office Action's objection under § 102.

Turangan and Rudell Do Not Contain Any Justification To Support Their Combination. Much Less In The Manner Proposed

The Office Action rejects claims 1-5 under 35 USC § 103 as being unpatentable over Turangan (5,316,294) in view of Rudell (5,195,745).

As summarized above, Turangan discloses and claims aids to a catching game, having attachment means covering large areas of a football and a glove, intended to facilitate catching of the football over a wide range of orientations.

Applicant submits that the Office Action's statement of claims of Turangan are inaccurate and does not provide a basis for combining with Rudell as suggested.

Rudell (U. S. Pat. No. 5,195,745) describes and claims a combination of a special object (football or flying toy disc) and a corresponding glove or wrist strap or finger-band, designed so that when the object is thrown by the user, the object is separated from the hand of the user with slight difficulty, "thereby causing the object to spin as it leaves the thrower's hand. This spinning of the object on its longitudinal axis provides the desired spiraling action that greatly enhances the accuracy and speed of the object as it travels through the air."

The physical features of the invention are chosen to facilitate the spiraling action of the football or other object, a contradictory action to that produced by the present invention. Thus, Rudell teaches away from the present invention.

5 The design of the special football included in the combination is based on the typical grasp of the football by the thrower (FIG. 1) "in the manner shown, with several fingertips 16 resting on or over the lacing 11" (Col. 3, Lines 38-39) and the bands and patches of coacting material are by necessity attached (FIG. 3, Fig. 4) near the midline of the football. No part of the thrower's hand
10 can reach to the end of the football in this typical grasp, thus there is no suggestion to modify the invention to include coverage of either end of the football, and again Rudell teaches away from the present invention.

 The throwing action recited in Rudell imparts spiraling radial momentum to the football due to this placement of the bands and patches of coacting
15 material and the downward motion of the thrower's hand as the football is released (FIG. 9; Col. 5, Lines 23-29). There is no suggestion of attaching a patch over the end of the football. If such a placement were made on a football and the thrower's hand grasped the football by the end, the interaction with the glove or wrist strap or finger band would not have facilitated the spiraling action
20 desired, but would have facilitated instead an undesirable end-over-end action.

 Thus Rudell teaches away from placement of a mating patch on one or both ends of the football.

 The Office Action states that Turangan does not disclose expressly the use of thimbles. Neither does Rudell disclose the use of thimbles, and there is
25 no suggestion to modify the invention in the direction of the present invention. The glove, wrist band and wrist strap claimed in Rudell are designed and intended to impart force and momentum from the user's hand to the thrown object, and to remain securely on the user's hand throughout the action. The thimble of the present invention is structurally distinguishable from the items
30 recited in Rudell, and is designed and intended to hold the football in a static position, not to impart force or motion to the football.

With regard to the proposed combination of Turangan and Rudell, it is well known that in order for any prior art *references themselves* to be validly combined for use in a prior art § 103 rejection, the references themselves (or some other prior art) *must* suggest that they be combined. E.g. as was stated in

5 In re Sernaker, 217 U.S.P.Q. 1.6 (C.A.F.C. 1983):

"[P]rior art references in combination do not make the invention obvious unless something in the prior art references would suggest the advantages to be derived from combining their teachings."

That the suggestion to combine the references should not come from the

10 applicant was forcefully stated in Orthopedic Equipment Co. v. United States, 217 U.S.P.Q. 193, 199 (C.A.F.C. 1983):

"It is wrong to use the patent in suit [here the patent application] as a guide through the maze of prior art references, combining the right references in the right way to achieve the result of the claims in suit [here

15 in the claims pending]. Monday morning quarterbacking is quite improper when resolving the question of nonobviousness in a court of law [here the PTO]."

As was further stated in Uniroyal, Inc. v. Rudkin-Wiley Corp., 5 U.S.P.Q.2d 1434 (C.A.F.C. 1988), "[w]here prior-art references require selective

20 combination by the court to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gleaned from the invention itself...*Something in the prior art must suggest the desirability and thus the obviousness of making the combination.*" [Emphasis supplied.]

In line with these decisions, the Board stated in Ex parte Levengood, 28

25 U.S.P.O.Q.. 2D 1300 (P.T.O.B.A.&d. 1993):

"In order to establish a *prima facie* case of obviousness, it is necessary for the examiner to present *evidence*, preferably in the form of some teaching, suggestion, incentive or inference in the applied art, or in the form of generally available knowledge, that one having ordinary skill in

30 the art *would have been led* to combine the relevant teachings of the applied references in the proposed manner to arrive at the claimed

invention...That which is within the capabilities of one skilled in the art is not synonymous with obviousness. That one can *reconstruct* and/or explain the theoretical mechanism of an invention by means of logic and sound scientific reasoning does not afford the basis for an obviousness
5 conclusion unless the logic and reasoning also supplies sufficient impetus to have led one of ordinary skill in the art to combine the teachings of the references to make the claimed invention...Our reviewing courts have often advised the Patent and Trademark Office that it can satisfy the burden of establishing a *prima facie* case of
10 obviousness only by showing some objective teaching in either the prior art, or knowledge generally available to one of ordinary skill in the art, that 'would lead' that individual 'to combine the relevant teachings of the references'...Accordingly, an examiner cannot establish obviousness by locating references which describe various aspects of a patent applicant's
15 invention without also providing evidence of the motivating force which would impel one skilled in the art to do what the patent applicant has done."

Insufficient Reason Is Given To Support The Proposed Combination

In the present case, there is no reason given in the Office Action to
20 support the proposed combination, other than the statement, "In view of Rudell it would have been obvious to select any one of the hand/finger coverings to use with the football of Turangan, since one of ordinary skill in the art, would have expected Turangan's invention to perform equally well with anyone of the above hand/finger coverings, because they all perform the same function of protecting
25 the hand and fingers from the football." It is not sufficient to gratuitously and selectively substitute part of one reference to parts of another reference to meet applicant's novel claimed invention.

Further, the justification given in the Office Action for selection of any one of Rudell's hand/finger coverings has no basis in Rudell. Nowhere in Rudell
30 is the function of protecting the hand or fingers from the football recited.

Applicants therefore submit that combining Turangan and Rudell is not legally justified and is therefore improper. Thus they submit that the rejection on these references is also improper and should be withdrawn.

Applicants respectfully request, if the claims are again rejected upon any
5 combination of references, that the Examiner include an explanation, in accordance with M.P.E.P. § 706.02. Ex parte Clapp, 27 U.S.P.Q. 972 (P.O.B.A. 1985) and Ex parte Levengood, supra, a "factual basis to support his conclusion that would have been obvious" to make the combination.

**Referenced Inventions Solved The Problems Recognized By The Inventors,
10 and There Was No Impetus to Modify Those Inventions Further**

Turangan's invention satisfactorily solved the problem recognized in that specification; there was no impetus to modify this invention further as suggested by the Office Action, and most certainly not in the direction suggested by the Office Action. Further, Rudell's invention (5,195,745) satisfactorily solved the
15 problem recognized in that specification; there was no impetus to modify this invention further as suggested by the Office Action, and most certainly not in the direction suggested by the Office Action.

**Even if Turangan and Rudell Were To Be Combined In the Manner
Proposed, The Proposed Combination Would Not Show All Of the Physical
20 Features Of Claims 1-5 (now 10-14)**

Turangan describes and claims coverage of both ends of the football by a "plurality of rectangular strips" (Col. 3, Line 25; Lines 30-45) "aligned to fully cover the end of the football without overlapping" (Claim 1, Lines 46-47), whereas the current invention describes and claims coverage of the pointed end
25 of the football by a single patch of hook or loop material affixed to one end of the football, or by a patch of such material affixed to each end of the football. Thus Turangan claims coverage of both ends of the football; coverage is accomplished by the attachment to the football of a plurality of strips of mating material, each extending from end to end of the football, and each tapered at
30 each end so that each end is covered by a mosaic of said tapered ends fitted together. Turangan further claims coverage of a large portion of the football

other than the pointed ends, by reciting a "plurality of rectangular strips",
whereas the present invention specifically recites the coverage of the football by
mating material ("only on the pointed end or ends of the football"; present
application, Page 2, Lines 12-14; Claim 10, Line 2; Claim 15, Line 2).

5 Rudell does not disclose the use of a thimble, and there is no suggestion
that the invention be modified as suggested by the Office Action. The thimble
claimed in the present invention is structurally distinguishable from the glove,
wrist strap and finger band claimed in Rudell.

Thus, even if these references were combined, the claims of the present
10 invention still recite novel subject matter over that combination, including novel
structural features.

For all of the above reasons, Applicant submits that the present invention
is patentable over Turangan in view of Rudell, and Applicant respectfully
requests reconsideration and withdrawal of the Office Action's objection under §
15 103.

**Applicant Has Examined the Other References Cited, and Found That
None Show the Present Invention or Render It Obvious**

Applicant has reviewed all references cited, and found that none
recognize the same problem, or show the present invention or render it obvious.

20 **Conclusion**

For all the above reasons, Applicant submits that the specification and
claims are now in proper form, and that the claims all define patentably over the
prior art. Therefore they submit that this application is now in condition for
allowance, which they respectfully solicit.

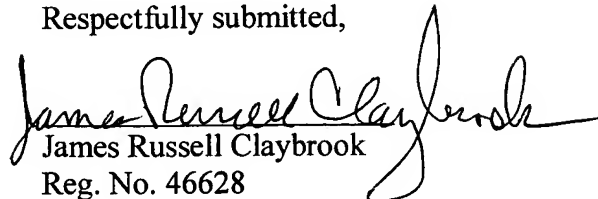
25 **Conditional Request For Constructive Assistance**

Applicants have amended the specification and claims of this application
so that they are proper, definite, and define novel structure which is also
unobvious. If for any reason this application is not believed to be in full
condition for allowance, Applicant respectfully requests the constructive
30 assistance and suggestions of the Examiner pursuant to M.P.E.P. § 2173.02 and

Appln. No. 10/676,209
Amdt. Dated Jan. 12, 2005
Reply to Office Action of Oct. 13, 2004

§ 707.07(j) in order that the undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Respectfully submitted,

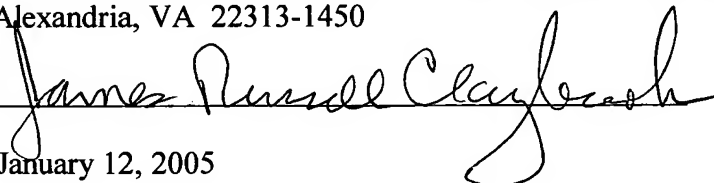

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I hereby certify that this paper, along with any paper referred to as being attached or enclosed, is being deposited with the United States Postal Service on the date shown below and is addressed to Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450

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Date: January 12, 2005

5

APPENDIX 1

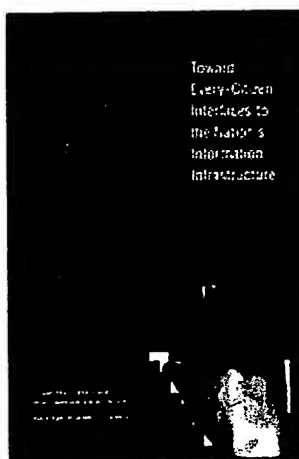
Usage Of The Term "Fingerpad"

10

1. "More Than Screen Deep: Toward Every-Citizen Interfaces to the Nation's Information Infrastructure"; Report of the National Research Council; Commission on Physical Sciences, Mathematics and Applications; National Academy Press, Washington, D.C., 1997. (Page 15, Lines 10-16).
15 (<http://www.nap.edu/readingroom/books/screen/index.html>)
2. "Biomechanics of Human Fingerpad-Object Contact", Report of the Massachusetts Institute of Technology Touch Lab (Laboratory for Human and Machine Haptics), Massachusetts Institute of Technology, Cambridge, MA
20 May 8, 2002.
(<http://touchlab.mit.edu/oldresearch/areas/biomechtouch/fingerpadproperties.html>)
3. "Sensorimotor Function of the Hand; Key Publications", Sensorimotor Research Unit, Department of Anatomy and Cell Biology, University of Melbourne, Victoria, Australia, September, 2004.
25

More Than Screen Deep

Toward Every-Citizen Interfaces to the Nation's Information Infrastructure



Toward an Every-Citizen Interface to the Nation's Information
Infrastructure Steering Committee

Computer Science and Telecommunications Board

Commission on Physical Sciences, Mathematics, and Applications

National Research Council

Notice

Toward an Every-Citizen Interface to the Nation's Information Infrastructure Steering Committee
Computer Science and Telecommunications Board
Commission on Physical Sciences, Mathematics, and Applications

Committee
Computer Science and Telecommunications Board
Commission on Physical Sciences, Mathematics, and Applications
Preface
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Summary

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NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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TOWARD AN EVERY-CITIZEN INTERFACE TO THE NATION'S INFORMATION

3

Input/Output Technologies: Current Status and Research Needs

Meeting the every-citizen interface (ECI) criteria described in Chapter 2 will require advances in a number of technology areas. Some involve advances in basic underlying display and interface technologies (higher-resolution visual displays, three-dimensional displays, better voice recognition, better tactile displays, and so on). Others involve advances in our understanding of how to best match these input/output technologies to the sensory, motor, and cognitive capabilities of different users in different and changing environments carrying out a wide variety of tasks. But the new interfaces will need to do more than just physically couple the user to the devices. To meet these visions, the interfaces must have the ability to assist, facilitate, and collaborate with the user in accomplishing tasks.

Subsequent chapters address interface design—the creation of interfaces that make the best-possible use of these human-machine communications technologies—and system attributes that lie beneath the veneer of the interface, such as system intelligence and software support for collaborative activities. This chapter examines the current state and prospective advances in technology areas related directly to communication between a person and a system—hardware and software for input (to the system) and output (to a human). The emphasis is on technical advances that, if implemented in well-designed systems (as stressed in Chapter 4), hold the potential to expand accessibility and usability to many more people than at present. The discussion includes a cluster of speech input/output technologies; natural language understanding (including restricted languages with limited vocabularies); keyboard input; gesture recognition and machine vision; auditory and touch-based output; interfaces that combine multiple modes of input and output; and visual displays, including immersive or virtual reality systems. Because the ECI challenge involves connecting to the information infrastructure, rather than just to stand-alone systems, this chapter reviews the current status of and research challenges for interfaces for systems in large-scale national networks. The chapter ends with the steering committee's conclusions, based on workshop discussions and other inputs, about the research priorities to advance these technologies and our understanding of how to use them to support every citizen.

FRAMING THE INPUT/OUTPUT DISCUSSION—LAYERS OF COMMUNICATION

The interface is the means by which a user communicates with a system, whether to get it to perform some function or computation directly (e.g., compute a trajectory, change a word in a text file, display a video); to find and deliver information (e.g., getting a paper from the Web or information from a database); or to provide ways of interacting with other people (e.g., participate in a chat group, send e-mail, jointly edit a document). As a communications vehicle, interfaces can be assessed and compared in terms of three key dimensions: (1) the language(s) they use, (2) the ways in which they allow users to say things in the language(s), and (3) the surface(s) or device(s) used to produce output (or register input) expressions of the language. The design and implementation of an interface entail choosing (or designing) the language for communication, specifying the ways in which users may express "statements" of that language (e.g., by typing words or by pointing at icons), and selecting device(s) that allow communication to be realized—the input/output devices.

Box 3.1 gives some examples of choices at each of these levels. Although the selection and integration of input/output devices will generally involve hardware concerns (e.g., choices among keyboard, mouse, drawing

Thus, the barriers to good matching to human hearing have to do with computing the right sound and getting it to each ear in a properly weighted way. Although in many ways producing sound by computer is simpler than displaying imagery, many orders of magnitude more research and development have been devoted to graphics than sound synthesis.

Haptic and Tactile Displays¹⁸

Human touch is achieved by the parallel operation of many sensor systems in the body (Kandel and Schwartz, 1981). The hand alone has 19 bones, 19 joints, and 20 muscles with 22 degrees of freedom and many classes of receptors and nerve endings in the joints, skin, tendons, and muscles. The hand can squeeze, stroke, grasp, and press; it can also feel texture, shape, softness, and temperature.

The fingerpad has hairless ridged skin enclosing soft tissues made of fat in a semiliquid state. Fingers can glide over a surface without losing contact or grab an object to manipulate it. Computed output and input of human touch (called "haptics") is currently very primitive compared to graphics and sound. Haptic tasks are of two types: exploration and manipulation. Exploration involves the extraction of object properties such as shape and surface texture, mass, and solidity. Manipulation concerns modification of the environment, from watch repair to using a sledge hammer.

Kinesthetic information (e.g., limb posture, finger position), conveyed by receptors in the tendons, and muscles and neural signals from motor commands communicate a sense of position. Joint rotations of a fraction of a degree can be perceived. Other nerve endings signal skin temperature, mechanical and thermal pain, chemical pain, and itch.

Responses range from fast spinal reflex to slow deliberate conscious action. Experiments on lifting objects show that slipping is counteracted in 70 milliseconds. Humans can perceive a 2-micrometer-high single dot on a glass plate, a 6-micrometer-high grating, using different types of receptors (Kalawsky, 1993). Tactile and kinesthetic perception extends into the kilohertz range (Shimoga, 1993). Tactile interfaces aim to reproduce sensations arising from contact with textures and edges but do not support the ability to modify the underlying model.

Haptic interfaces are high-performance mechanical devices that support bidirectional input and output of displacement and forces. They measure positions, contact forces, and time derivatives and output new forces and positions (Burdea, 1996). Output to the skin can be point, multipoint, patterned, and time-varying. Consider David Warner, who makes his rounds in a "cyberwear" buzz suit that captures information from his patients' monitors, communicating it with bar charts tingling his arms, pulse rates sent down to his fingertips, and test results whispered in his ears, yet allowing him to maintain critical eye contact with his patients (<http://www.pulsar.org>).

There are many parallels and differences between haptics and visual (computer graphics) interfaces. The history of computing technology over the past 30 to 40 years is dominated by the exponential growth in computing power enabled by semiconductor technology. Most of this new computing power has supported enriched high-bandwidth user interfaces. Haptics is a sensory/motor interaction modality that is just now being exploited in the quest for seamless interaction with computers. Haptics can be qualitatively different from graphics and audio input/output because it is bidirectional. The computer model both delivers information to the human and is modified by the human during the haptic interaction. Another way to look at this difference is to note that, unlike graphics or audio output, physical energy flows in both directions between the user and the computer through a haptic display device.

In 1996 three distinct market segments emerged for haptic technology: low-end (2 degrees of freedom (DOF), entertainment); mid-range (3 DOF, visualization and training); and high-end (6 DOF, advanced computer-aided engineering). The lesson of video games has been to optimize for real-time feedback and feel. The joysticks or other interfaces for video games are very carefully handled so that they feel continuous. The obviously cheap

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Biomechanics of Human Fingerpad-Object Contact

The goals of this research are (1) to determine the growth and motion of contact regions and the associated force variations over time between the human fingerpad and carefully chosen transparent test objects whose microtexture, shape or softness is varied in a controlled manner and (2) Experimental measurement of the surface deformations of human fingertips under shaped indentors. The results obtained are being used to gain a deeper understanding of the neurophysiological and psychophysical data we have already obtained for the same test objects.



To measure the in vivo surface deformations of the fingerpad under various tactile stimuli, we have designed a videomicroscopy system together with a high precision tactile stimulator. The videomicroscopy system consists of a set of video zoom lenses attached to a high-resolution CCD camera, whose output can either be digitized into the computer system memory in real time at about 20 frames/s, or stored on a laserdisk at 30 frames/s for off-line digitization. The zoom lenses enable continuous variation of magnification, with the field of view covering the entire fingerpad, or just a few fingerprint ridges. The tactile stimulator is composed of a linear stepper motor with a microstepping drive. The motor is controlled by a 80386 PC, with a specified indentation velocity commanded by a 80486 PC via a digital link. To record the contact force, a strain gage based single degree of freedom force sensor is mounted on the motor to which a transparent test object can be attached for both biomechanical and psychophysical experiments. This method allows the force and video data to be

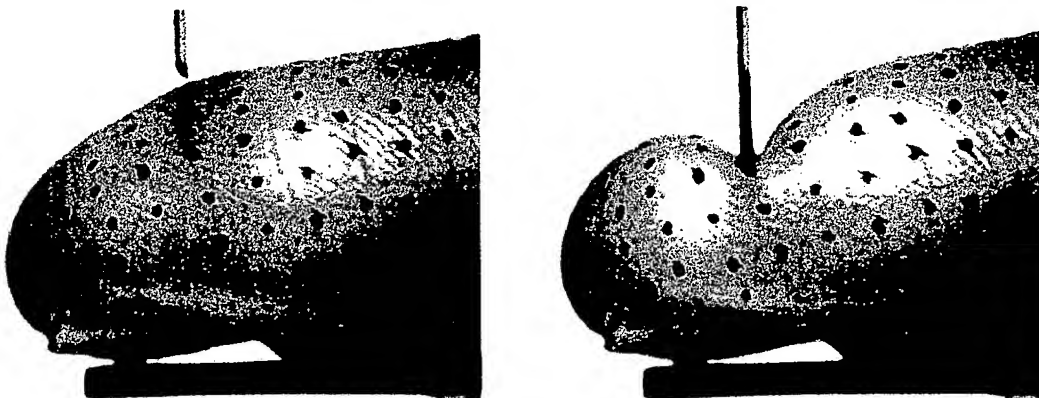
synchronised and stored in the 80486 PC. With this setup, we are able to investigate how the skin-object contact region changes with indentation velocity and force. In active touch experiments the subject contacts a stationary specimen, whereas in passive touch experiments the stimulator moves the specimen to indent a stationary finger at a given velocity. High contrast images of the contact interface are achieved with coaxial and other fiberoptic lighting.

Videomicroscopy of the fingerpad-object contact regions

Using the test facility described above, we have performed a set of experiments with human subjects to investigate the relationship between the contact force, contact area and compliance of the object. The experiments involved active indentation of transparent compliant rubber specimens and a glass plate with the subjects' fingerpads. Static video images of the contact regions were captured at various force levels and magnifications. In order to minimize the effects of non-uniform illumination, we implemented homomorphic image processing algorithms with or without image decimation. The processed images showed that contact regions consisted of discontinuous 'islands' along each finger ridge, with clear distinction between contact and non-contact regions over the entire field of view.

Results show that for objects whose compliances are discriminable, even when the overall contact areas under a given contact force are the same, the actual contact areas can differ by a factor of two or more. The actual pressure distribution, which acts only within the discontinuous contact islands on the skin, will therefore be radically different for the objects. Consequently, a spatio-temporal neural code for object compliance emerges with far higher resolution than an intensive code such as the average pressure over the overall contact area. These results are in agreement with our hypothesis that the neural coding of objects with deformable surfaces (such as rubber) is based on the spatio-temporal pressure distribution on the skin. This was one of the conclusions from our previous psychophysical, biomechanical and neurophysiological experiments (Srinivasan and LaMotte, 1995;1996).

Measurement of Surface Deformation of Human Fingerpads



The finite element models described previously need to be verified by comparing the experimentally observed skin surface deformations with those predicted by the finite

element models under the same mechanical stimuli. The experimental data was obtained by indenting human fingerpads with several cylindrical and rectangular indentors and acquiring images of the undeformed and deformed fingerpad using the videomicroscopy setup (Roby, Dandekar, and Srinivasan, 1994; Roby and Srinivasan, 1995). Fine markers were placed on the fingerpad and the skin surface deformation was measured by tracking the displacements of the markers in the high resolution video images. The same experiment was simulated using the finite element models of the human fingertip and the displacements of corresponding points were compared with the experimental data. The displacements predicted by the multilayered 3D model matched the experimental data quite well (Dandekar, 1995).

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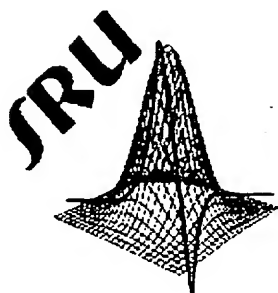
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Sensorimotor Function of the Hand

Key Publications

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5

APPENDIX 2

10

Definition Of The Term "Patch"

1. Compact Oxford English Dictionary. Definition: patch
(http://www.askoxford.com/concise_oed/patch/view=uk)

Appendix 2



AskOxford.com

Oxford Dictionaries. Resources about language

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Compact Oxford English Dictionary

patch

• **noun** **1** a piece of material used to mend a hole or strengthen a weak point. **2** a small area differing in colour, composition, or texture from its surroundings.

3 a small plot of land: *a cabbage patch*. **4** Brit. informal a brief period of time: *a bad patch*. **5** Brit. informal an area for which someone is responsible or in which they operate. **6** a shield worn over a sightless or injured eye. **7** an adhesive piece of drug-impregnated material worn on the skin so that the drug may be gradually absorbed. **8** a temporary electrical or telephone connection. **9** Computing a small piece of code inserted to correct or enhance a program.

• **verb** **1** mend, strengthen, or protect by means of a patch. **2** (**patch up**) informal treat (injuries) or repair (something) hastily or temporarily. **3** (**patch up**) informal settle (a quarrel or dispute). **4** (**patch together**) assemble hastily. **5** connect by a temporary electrical, radio, or telephonic connection.

— PHRASES **not a patch on** Brit. informal greatly inferior to.

— DERIVATIVES **patcher** noun.

— ORIGIN perhaps from Old French dialect *pieche* 'piece'.

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UTILITY APPLICATION

FOR

UNITED STATES LETTERS PATENT

BY NOEL P. HORKAN

FOR

FOOTBALL KICKING TRAINING AID

FOOTBALL KICKING TRAINING AID

Background of the Invention

[0001] This invention relates to a training aid and, more particularly, to a
5 modified football and thimble or glove combination which assists in teaching a
player to correctly support a football while another player kicks the football.

[0002] The effective supporting of a football, placed on the ground or a tee
while it is kicked, is not always readily learned, particularly in the case of a
young or novice football player. The younger or novice player is more likely to
10 withdraw support of the football or to flinch, causing the football to fall or move
from its preferable position, as the other player approaches the football. This
type of ball movement results in incorrect football supporting techniques that
must later be corrected. Thus, the correct placement of the supporter's fingerpad
(the palm side of the fingertip) atop the football is an important aspect in
15 correctly supporting a football for kicking by another player and maintaining
that correct support. Accordingly, it is desirable to present a training aid which
urges an initial, correct interaction between the supporter's fingerpad and the
football which enhances the development of a proper supporting action, and the
continuation of that support throughout the kicking action.

20 [0003] Known prior art devices have not addressed the above problems.
Various patents disclose devices and complex apparatus designed to hold
footballs in proper orientation for kicking. Such devices and apparatus are
aimed at training of the kicker, not of the player supporting the football while it
is kicked. (U. S. Pat. No. 4,949,973; U. S. Pat. No. 5,435,572; U. S. Pat. No.
25 4,807,880; U. S. Pat. No. 4,477,077; U. S. Pat. No. 4,632,395; U. S. Pat. No.
4,033,581; U. S. Pat. No. 5,553,855; U. S. Pat. No. 5,488,780; U. S. Pat. No.
4,711,043; U. S. Pat. No. 5,280,922).

Brief Summary of the Invention

[0004] In response to the needs described I have invented a training aid in the
30 form of a modified football and a modified thimble or glove. The modified
football has attached at one or both pointed ends a patch or patches having

thereon one element of the loop and hook product sold under the trademark VELCRO.RTM. A flexible thimble or glove has the complementary mating elements of the loop and hook product sold under the trademark VELCRO.RTM only at one fingerpad area thereof. The use of the loop and hook product sold
5 under the trademark VELCRO.RTM in a patch or patches only on the pointed end or ends of the football forces the thimbled or gloved user to properly support the football only at such patch. The patch or patches of the loop and hook product sold under the trademark VELCRO.RTM do not interfere with the normal game play by ungloved players.

10 [0005] It is therefore a general object of this invention to provide a training aid in the form of a modified football and modified thimble or glove combination which assists in proper support of a football during a place kick action.

[0006] A further object of this invention is to provide a training aid, as aforesaid, which does not interfere with normal game play by ungloved players.

15 [0007] Still another object of this invention is to provide a training aid, as aforesaid, which improves the user's support and control of the football while it is being supported for kicking.

[0008] Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying
20 drawings, wherein is set forth by way of illustration and example, an embodiment of this invention.

Brief Description of the Drawings

[0009] FIG. 1 is a perspective view showing a user supporting a modified football with one index finger in a modified flexible thimble;

25 [0010] FIG. 2 is a perspective view showing a user supporting a modified football with one index finger in a modified flexible glove.

Description of the Preferred Embodiment

[0011] Turning more particularly to the drawings, FIG. 1 shows the football 1 modified by attachment of patches 2 at both pointed ends of said football,
30 having fastener elements of the loop and hook product sold under the trademark VELCRO.RTM thereof preferably of the loop-type design, the loop type

elements being less susceptible to damage or sticking to clothing or other items during game play. FIG. 1 also shows the football 1 resting on the ground 3 and being supported by the fingerpad of a user's index finger 4 in a modified flexible thimble 5, having an attachment of a pad 6 having fastener elements of the loop and hook product sold under the trademark VELCRO.RTM complementary to the fastener elements of the patches 2. The complementary mating fastener elements of the loop and hook product sold under the trademark VELCRO.RTM of the pad 6 are preferably of the hook type design.

[0012] An alternate design of the modified football 1 has one patch of the loop and hook product sold under the trademark VELCRO.RTM, which the user orients at the top of football 1.

[0013] It is also understood that a combination of hook and loop elements may be used such that elements on the patch or patches 2 are of hook type design and elements on the pad 6 are of loop type design.

[0014] FIG. 2 shows the football 1 modified by attachment of patch or patches 2 having fastener elements of the loop and hook product sold under the trademark VELCRO.RTM thereof preferably of the loop-type design, the loop type elements being less susceptible to damage or sticking to clothing or other items during game play. FIG. 2 also shows the football 1 resting on the ground 3 and being supported by the fingerpad of a user's index finger 7 in a modified flexible glove 8, having an attachment of a pad 9 having fastener elements of the loop and hook product sold under the trademark VELCRO.RTM complementary to the fastener elements of the patch or patches 2. The complementary mating fastener elements of the loop and hook product sold under the trademark VELCRO.RTM of the pad 9 are preferably of the hook type design.

[0015] It is also understood that a combination of hook and loop elements may be used such that elements on the patch or patches 2 are of hook type design and elements on the pad 9 are of loop type design.

[0016] The restriction of the loop elements of the loop and hook product sold under the trademark VELCRO.RTM to the patch or patches 2 of the football 1 is important. No materials of the loop and hook product sold under the trademark

VELCRO.RTM are positioned elsewhere on the football as shown in prior patents (U. S. Pat. No. 5,570,882; U. S. Pat. No. 5,183,263; U. S. Pat. No. 5,195,745). Accordingly, the mating of the elements of the loop and hook product sold under the trademark VELCRO.RTM on the flexible thimble 5 or flexible glove 8 occurs only when the football 1 is properly supported by a thimbled or gloved user at the patch 2 of football 1. This restriction urges an initial proper FIG. 1 or FIG. 2 support of the football 1 by a thimbled or gloved user only at the patch 2 as the thimbled or gloved user cannot obtain the tactile feedback of attachment if supporting the football elsewhere.

10 [0017] The flexible thimble 5 may be of any resilient material, but the preferred embodiment is that the material be a natural or synthetic rubber. It is important that the pad 6 be found only at a lateral area of the thimble, said area being positioned by the user adjacent to the fingerpad of the user's index finger. The glove 8 may be of any flexible material, it being important that the pad 9 is found only at the lateral area of the index finger adjacent to the fingerpad. This placement of the pad 6 or 9 cooperates with the above-described patch 2 of the football 1 to again assure that the football is properly supported by the fingerpad of the index finger of the user.

15 [0018] Accordingly, upon supporting the football 1 by the index finger 4, as shown in FIG. 1, the ball 1 is properly supported and not unstable as often found with the younger or novice user. Of course, the degree of interaction between the mating elements of the loop and hook product sold under the trademark VELCRO.RTM on the patch 2 and pad 6 or 9 must be minimal so as to not to interfere with the release of the football 1.

20

Claims

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is as follows:

5 **Listing of Claims:**

Claims 1-9 (canceled)

10. A football kicking training aid comprising in combination:

a football having at least one attached patch, said patch or patches covering only one or both pointed ends of said football and not having a diameter greater than
10 two inches, said patch or patches having a plurality of either male or female fastener elements thereon;

a flexible thimble having a lateral area which user can position adjacent the fingerpad of said user wearing said thimble;

a pad on the said lateral area of said thimble, said pad having a plurality of
15 mating fastener elements thereon complementary to said fastener elements on said patch or patches, said mating elements on said thimble worn by a user releasably engaging said mating elements on said patch located at the upper end of said football, whereby said mating of said complementary fastener elements urges a user to properly support said football, for kicking by another player, at
20 said patch only at said upper end by a user's fingerpad within said thimble, and to continue supporting said football until the kicking action has been completed.

11. The device as claimed in claim 10 wherein said mating fastener elements disengage from said complementary mating elements upon a player kicking said football.

25 12. The device as claimed in claim 10 wherein said mating elements on said patch or patches comprise loop elements of the loop and hook product sold under the trademark VELCRO.RTM.

13. The device as claimed in claim 10 wherein said mating elements on said patch or patches comprise hook elements of the loop and hook product sold
30 under the trademark VELCRO.RTM.

14. The device as claimed in claim 10 wherein the material of said thimble is natural or synthetic rubber.

15.. A football kicking training aid comprising in combination:

5 a football having at least one attached patch, said patch or patches covering only one or both pointed ends of said football and not having a diameter greater than two inches, said patch or patches having a plurality of either male or female fastener elements thereon;

a flexible glove having a plurality of fingers, said fingers having lateral areas positioned adjacent the fingerpads of a user wearing said glove;

10 a pad on said lateral area of the index finger of said glove, said pad having a plurality of mating fastener elements thereon complementary to said fastener elements on said patch, said mating elements on said glove worn by a user releasably engaging said mating elements on said patch located at the upper end of said football, whereby said mating of said complementary fastener elements

15 urges a user to properly support said football, for kicking by another player, at said patch at said upper end by a user's fingerpad within said glove, and to continue supporting said football until the kicking action has been completed.

16. The device as claimed in claim 15 wherein said mating fastener elements disengage from said complementary mating elements upon a player kicking said

20 football.

17. The device as claimed in claim 15 wherein said mating elements on said patch or patches comprise loop elements of the loop and hook product sold under the trademark VELCRO.RTM.

18. The device as claimed in claim 15 wherein said mating elements on said

25 patch or patches comprise hook elements of the loop and hook product sold under the trademark VELCRO.RTM.

FOOTBALL KICKING TRAINING AID

Abstract

A football kicking training aid comprises a modified football having an attached
5 patch on one or both ends, with loop elements of the loop and hook product sold
under the trademark VELCRO.RTM therein. The football is supported in place,
for kicking by another player, by a user wearing a thimble or glove having hook
elements of the loop and hook product sold under the trademark VELCRO.RTM
only at a fingerpad area thereof. The restriction of the elements of the loop and
10 hook product sold under the trademark VELCRO.RTM to the football patch and
the fingerpad area of the glove or thimble urges the user to support the football
only at the patch, and to continue supporting the football until the kicking action
has been completed.